

Claims

1. A digital camera comprising:
  - an image sensor for capturing an image;
  - 5 a lens arrangement arranged to focus light onto the image sensor and providing a variable focus;
  - a memory for storing images captured by the image sensor; and
  - a controller arranged to control the operation of the digital camera, the controller being arranged to perform an image capture operation comprising:
    - 10 causing a series of images, each consisting of the entire image area and having differing focus provided by the lens arrangement, to be captured by the image sensor and stored in the memory; and
    - analyzing the images stored in the memory to determine the quality of the focus of the images and on the basis of the analysis deriving an in-focus image from the series
    - 15 of images.
2. A digital camera according to claim 1, wherein the lens arrangement is movable to vary the focus.
- 20 3. A digital camera according to claim 2, wherein the digital camera further comprises:
  - a button operable by a user; and
  - a mechanical linkage connecting the button to the lens arrangement and adapted to move the lens arrangement on operation of the button, the controller being arranged to
  - 25 perform said image capture operation in response to operation of the button with the series of images being captured as the lens arrangement is moved on operation of the button.

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4. A digital camera according to claim 3, wherein the linkage mechanism is arranged to moved the lens arrangement from its rest position by depression of the button and further comprises:

5 a resilient element arranged to bias the lens arrangement back towards its rest position after depression of the button; and

a damper arranged to control the speed of movement of the lens arrangement back towards its rest position,

10 the controller being arranged to perform said image capture operation with the series of images being captured as the lens arrangement is moved back towards its rest position after depression of the button.

5. A digital camera according to claim 2 or 3, wherein the digital camera further comprises an actuator arranged to move the lens arrangement, and the image capture operation further comprises controlling the actuator to move the lens arrangement to  
15 vary the focus, said capture of the series of images being performed as the actuator is thus moved.

6. A digital camera according to claim 5, wherein the actuator is a piezoelectric actuator or an electric motor.  
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7. A digital camera according to any one of the preceding claims, wherein said step of deriving an in-focus image comprises selecting one of the images of the series determined to have the best focus.

25 8. A digital camera according to claim 6, wherein the quality of the focus of the images is determined on the basis of an area of analysis which is a partial area of the entire image area.

9. A digital camera according to any one of claims 1 to 5, wherein said step of deriving an in-focus image comprises synthesizing an image from the series of images.

10. A digital camera according to claim 8, wherein the quality of the focus of the  
5 images is determined in each of a plurality of parts of the image and said step of deriving an in-focus image comprises synthesizing an image from the series of images by, in respect of each of said plurality of parts of the image area, selecting the part of the image area determined to have the best focus from one of the series of images.

10 11. A digital camera according to claim 9, wherein the quality of the focus of the images is determined in each of a plurality of parts of the image on the basis of an area of analysis which is a partial area of the part of the image area.

12. A digital camera according to claim 9, wherein the quality of the focus of the  
15 images is determined in each of a plurality of parts of the image on the basis of an area of analysis which is the entire area of each part of the image area.

13. A digital camera according to claim 9, wherein the quality of the focus of the  
20 images is determined in each of a plurality of parts of the image on the basis of an area of analysis consisting of the entire area of that part of the image area and an adjacent area.

14. A digital camera according to claim 12, wherein said parts of the image area each  
comprise a single pixel.

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15. A digital camera according to any one of the preceding claims, wherein said step of analyzing the images stored in the memory to determine the quality of the focus of the images and on the basis of the analysis deriving an in-focus image from the series of

images is performed after all the series of images have been stored in the memory.

16. A digital camera according to any one of claims 1 to 13, wherein said step of analyzing the images stored in the memory to determine the quality of the focus of the  
5 images and on the basis of the analysis deriving an in-focus image from the series of images is performed as successive images of the series are captured by  
initially storing the first image of the series as said in-focus image and  
in respect of each successive image in the series analysing the image to determine  
the quality of the focus of the image in comparison with the image stored as said in-  
10 focus image and on the basis of the analysis updating the image stored as said in-focus image.
17. A digital camera according to any one of the preceding claims, wherein the  
digital camera has a display and the in-focus image is displayed on the display.
18. A digital camera according to any one of the preceding claims, wherein the in-  
focus image is stored in said memory.
19. A focus method for a digital camera having an image sensor for capturing an  
20 image, a lens arrangement arranged to focus light onto the image sensor and having a variable focus, and a memory for storing images captured by the image sensor, the autofocus method comprising:  
capturing a series of images, each consisting of the entire image area, and storing  
them in the memory; and  
25 analysing the images stored in the memory to determine the quality of the focus  
of the images and on the basis of the analysis deriving an in-focus image from the series  
of images.

20. A focus method for a digital camera wherein a series of images at a series of lens positions is captured, an autofocus algorithm is used to determine which of said captured images is best in-focus, and said best in-focus image is selected for display and/or retention.

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21. A focus method for a digital camera wherein a series of images at a series of lens positions is captured, a composite in-focus image is synthesised from said series and said composite image is displayed and/or retained.

10 22. A digital camera including a button operable by a user, a lens element movable to alter the focal length of the lens assembly, and a mechanical linkage connecting said button to said lens element, wherein the mechanical linkage is adapted to move the lens element when the button is depressed by the user.